

Application Serial No. 10/618,216
Amendment dated May 11, 2006
Reply to Office Action dated February 14, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A liquid level monitoring system for monitoring events in a wastewater or other liquid handling system, comprising:

a battery-powered sensor module capable of detecting liquid handling system events, said sensor module being associated with a segment of the liquid handling system;

said sensor module including a wireless communication device having a processor and associated software enabling said communication device to detect events and generate event messages relating to at least one of liquid level and sensor module status, said communication device capable of immediately transmitting said event messages upon detection of an event selected from the group consisting of a liquid level event and a sensor module status event; and

a processing system receiving said event messages and producing and routing a notification message, said notification message including at least one of event location, identification of said segment, and event status.

Claim 2 (original): The liquid level monitoring system of claim 1, wherein said module includes a capacitive probe and a capacitive sensing circuit electrically coupled to said capacitive probe and said communication device.

Claim 3 (original): The liquid level monitoring system of claim 2, wherein said capacitive probe comprises a sensor wire encased by a dielectric material.

Claim 4 (original): The liquid level monitoring system of claim 2, further comprising a wireless provider network receiving said event messages from said communication device and retransmitting said event messages to said processing system via a communications network.

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Claim 5 (original): The liquid level monitoring system of claim 4, wherein said communications network comprises the Internet and said wireless provider network comprises a cellular network.

Claim 6 (original): The liquid level monitoring system of claim 2, wherein the liquid handling system includes a manhole cover assembly and said sensor module is mounted to the manhole cover assembly.

Claim 7 (original): The liquid level monitoring system of claim 6, wherein said sensor module is mounted to an interior surface of the manhole cover assembly supporting ring.

Claim 8 (previously presented): The liquid level monitoring system of claim 7, wherein said capacitive probe depends downward from the manhole cover assembly.

Claim 9 (previously presented): The liquid level monitoring system of claim 2, wherein said wireless communication device includes at least one of a dipole antenna, a roadway embedded loop antenna, a composite manhole cover embedded antenna, and a manhole cover top mount antenna.

Claim 10 (original): The liquid level monitoring system of claim 2, wherein said event message includes at least one of a high liquid event, a low liquid event, a built-in-test event, a battery low event, a still-alive event, a sensor module identifier, and a sensor module location.

Claim 11 (original): The liquid level monitoring system of claim 2, wherein said notification message comprises at least one of a liquid handling system, a sensor module status, a status location map, a Webpage, an e-mail, a pager message, and a phone call.

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Claim 12 (original): The liquid level monitoring system of claim 2, wherein:

said processing system further comprises a database storing sensor module identifiers and installed sensor module locations, and

said event location is determined by correlating said sensor module identifier with said installed sensor module locations.

Claim 13 (original): The liquid level monitoring system of claim 2, wherein said wireless communication device is in a low-power standby mode or no-power off mode until said sensing circuit activates said wireless communication device.

Claim 14 (original): The liquid level monitoring system of claim 1, further comprising a wireless device having a GPS locator and capable of communicating with said processing system.

Claim 15 (original): The liquid level monitoring system of claim 14, wherein said wireless device is web-enabled.

Claim 16 (currently amended): A battery-powered sensor module, comprising:

a probe;

a circuit having a detector connected to said probe and capable of detecting a high liquid level on said probe; and

a wireless communication device connected to said circuit and having a processor and associated software enabling said communication device to generate event messages based on output of said circuit, said event messages relating to at least one of liquid level and sensor module status, said communication device capable of immediately transmitting said event messages upon detection of an event selected from the group consisting of a liquid level event and a sensor module status event.

Claim 17 (original): The sensor module of claim 16, wherein said communication device includes a low power standby state.

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Claim 18 (original): The sensor module of claim 16, wherein said circuit is capable of selectively powering said communication device.

Claim 19 (original): The sensor module of claim 16, wherein said probe is a capacitive probe.

Claim 20 (original): The sensor module of claim 19, wherein the module is mounted to a manhole cover or cover ring; and said capacitive probe depends downwardly from said module into a space below said manhole cover.

Claim 21 (original): The sensor module of claim 19, wherein said capacitive probe comprises a wire having a dielectric covering.

Claim 22 (previously presented): The sensor module of claim 16, wherein said wireless communication device includes at least one of a dipole antenna, a roadway embedded loop antenna, a composite manhole cover embedded antenna, and a manhole cover top mount antenna.

Claim 23 (original): The sensor module of claim 16, wherein said event message includes at least one of a high liquid event, a low liquid event, a built-in-test event, a battery low event, a still-alive event, a sensor module identifier, and a sensor module location.

Claim 24 (original): The sensor module of claim 16, wherein said circuit comprises a timer for periodically activating said communication device.

Claim 25 (original): The sensor module of claim 16, wherein said circuit comprises a sensor capable of detecting a low battery and activating said communication device.

Claim 26 (original): The sensor module of claim 16, wherein said circuit comprises components for initiating a built-in test of the sensor module and capable of activating said communication device.

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Claim 27 (original): The sensor module of claim 16, wherein said circuit is capable of disconnecting power from said communication device upon said detector detecting a low liquid level.

Claim 28 (original): The sensor module of claim 16, wherein said communication device is capable of transmitting said event messages to at least one of a CDMA, TDMA, and GSM based wireless network.

Claim 29 (withdrawn): A method of monitoring the liquid level of a wastewater handling system comprising the steps of:

- installing a sensor module in a segment of the wastewater handling systems, the sensor module having a wireless communication device and a sensor circuit;
- registering the sensor module location and identification code in a processing system;
- activating power to the communication device upon the sensor circuit detecting a first high liquid level; and
- transmitting an event message including the sensor module identification code from the communication device to the processing system.

Claim 30 (withdrawn): The method of claim 29, further comprising transmitting a notification message from the processing system to a notification recipient upon receipt of an event message.

Claim 31 (withdrawn): The method of claim 29, wherein said step of registering the sensor module includes transmitting to the processing system the location of the sensor module from a wireless device equipped with a GPS locator.

Claim 32 (withdrawn): The method of claim 29, further comprising disabling power to the communication device upon the sensor circuit no longer detecting a first high liquid level.

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Claim 33 (withdrawn): The method of claim 32, wherein the step of disabling power includes transmitting an event message from the communication device before disabling power.

Claim 34 (withdrawn): The method of claim 29, further comprising activating the communication device and transmitting an event message upon detecting a low battery level.

Claim 35 (withdrawn): The method of claim 29, further comprising transmitting an event message upon detecting a second high liquid level.

Claim 36 (withdrawn): The method of claim 29, further comprising switching the communication device to a low power standby state upon completion of transmitting an event message.

Claim 37 (withdrawn): The method of claim 29, further comprising activating the communication device and transmitting an event message on a predetermined periodic basis.